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TIGHT SHOE LACE-UP DEVICE

The present invention relates to a tight lace-up device using a lace-type linkage and adapted to equip a footwear used, in particular, but in a non-limiting fashion, in sporting activities. This tight lacing is more specifically adapted to shoes whose upper is reinforced, and which are used in particular for snowboarding, in-line roller skating, alpine skiing, mountain skiing and telemark skiing, ice skating, etc.

To properly tighten a shoe of the aforementioned type, it is necessary to tie the lace tightly. In addition, using a lace-type tightening makes it possible to preserve a lightweight and inexpensive system, as compared to the other mechanical locking means such as buckles. However, to obtain a tight lacing, it is necessary to reduce the friction of the lace in the lace returns. The improved sliding occurs in particular by reducing the section of the lace, which reduces the friction contact surface. Nevertheless, the small section of the lace tends to cause a painful shearing effect in the hand, and this prevents the user from applying enough tension in order to efficiently tighten the shoe.

The document FR 2 752 686 proposes a first alternative by describing a lace having variable sections. The central portion is small in diameter so as to slide easily in the returns, and the ends of the lace have larger sections in order to provide greater comfort for the hands. However, even though this system makes it possible to tension the lace correctly, it does not make it possible to maintain the tension due to a locking of the lace by a knot. Indeed, during the time necessary required for tying the knot, the user is forced to release the tension in the lace. Furthermore, the system is expensive to implement, for it requires specific means for manufacturing the lace.

The document FR 2 706 743 describes a lace-up device where the lace having a small section passes in returns minimizing the friction and forms a loop. The lace is locked by an independent locking element that slides along the lace outside the lacing zone. The locking element makes it possible to maintain the tension in the lace. However, the user cannot apply a substantial tension in the lace. Indeed, the user is forced to grab the loop of the lace with at least one finger and to pull thereon, which quickly shears the skin due to the small diameter of the lace.

One of the objects of the present invention is to propose a lace-up device for a footwear using a linkage that makes it possible to ensure a tight lacing, while preserving the user's comfort during the tightening phase.

Another object of the invention is to propose an inexpensive lace-up device that does not require the use of specific means to manufacture the linkage.

To achieve these objects, the lace-up device includes a linkage that connects, along a predetermined travel, at least two return elements arranged on different portions of the footwear to be brought closer together, and which forms a loop located outside the tightening zone. The linkage is equipped at the level of the loop with a gripping device that enables the user to efficiently pull on the linkage with at least one hand. This gripping device includes a rigid frame making it possible to distribute the tension of the linkage over the hand. In addition, this lace-up device includes a locking means integrated into the return elements that are positioned at the junction of the lacing zone and of the loop. Thus, the user can maintain the tension in the linkage and, therefore, in the lacing zone, during the locking.

In a first embodiment, the gripping device is positioned at one of the ends of the tightening zone.

In a second embodiment, the gripping device is positioned perpendicular to the tightening zone.

The invention will be better understood and other advantages thereof will become apparent from the description that follows, with reference to the annexed drawings. The description illustrates, by way of non-limiting examples, certain preferred embodiments.

Figure 1 shows a side view of a footwear equipped with the lace-up device according to the first embodiment in a first tightening phase.

Figure 2 shows a side view of the footwear equipped with the lace-up device according to the first embodiment in a second tightening phase.

Figure 3 shows a front view of a detail of the gripping device.

Figure 4 shows a three-quarter top view of the lace-up device according to the second embodiment.

In Figure 1, the footwear CH shown is a snowboard boot. Of course, the invention applies to any type of boot whose flexible upper is reinforced either to increase the stiffness in bending of the upper, or to protect the foot and ankle from impacts and external attacks. This type of boot is found in sports such as snowboarding, in-line roller skating, ice skating.

The invention also applies to boots provided with an external rigid shell made of plastic, for example, and used, in particular, for alpine skiing, snowboarding, in-line roller skating, ice skating, mountain skiing or telemark skiing.

The footwear CH includes an upper O comprising two portions 12a and 12b adapted to be brought closer together by the lace-up device. This lace-up device generally includes

a tightening zone 16, which here is divided into two zones 16e and 16f. In a conventional and known manner, the tightening zone 16 comprises return elements 50a-54a and 50b-54b positioned on each of the two portions 12a and 12b, respectively.

A linkage 15, such as a lace or cable, connects at least two return elements 50a and 50b along a predetermined travel. Of course, the linkage 15 can advantageously connect all of the return elements to complete the tightening. In addition, the linkage 15 forms a loop 2 located outside the tightening zone 16.

To maintain the tension in the linkage 15, the lace-up device also includes a means 20 for locking the linkage 15.

Figure 1 more specifically illustrates the first tightening phase of the device, which is adapted to tighten a boot with a high upper. This phase ensures the tightening of the lower tightening zone 16e, which extends approximately from the metatarsophalangeal articulation up to the ankle, by making it possible to firmly hold the instep in the footwear CH. The lower tightening zone 16e includes a series of return elements 53a and 53b which advantageously have an adapted device making it possible to reduce the friction of the linkage 15 in said return elements.

Despite the use of adapted return elements as described in the document FR 2 706 743, tests have shown that it is preferable to limit to four, for example, the number of return elements 53a and 53b arranged on each of the portions 12a and 12b for each tightening zone 16e and 16f in order to optimize the tightening.

The lower tightening zone 16e is ended by two return elements 52a and 52b, arranged on each of the portions 12a and 12b, which possibly have specific functions which will be detailed subsequently, and which separate the two tightening zones 16e and 16f.

The linkage 15, which comes out of the return elements 52a and 52b, forms a loop 2 that includes a gripping device 1 arranged on the linkage 15. This gripping device 1 enables the user of the footwear CH to easily grab the loop 2, and to easily exert a generally upward force F1 on the loop 2. This force F1 generates a tension in each strand of the linkage 15 that contributes to the tightening power of the present lace-up device by bringing the two portions 12a and 12b closer together. However, since the tension in each strand of the linkage 15 corresponds substantially to one half of said force F1, it is important that the gripping device 1 ensure the user's comfort during the tightening.

To achieve this object, the gripping device 1 comprises a rigid frame 3. This rigidity makes it possible to distribute the tension of the linkage 15 over the user's hand by limiting the shearing effect of the linkage on the skin. Thus, the more the pain on the hand is

reduced, the more firmly the user can pull on the gripping device 1.

The rigid frame 3 can be advantageously made out of a material having a certain bending strength, in particular thermoplastic materials such as polyamide, polypropylene, and according to an adapted geometry that promotes greater inertia along the direction of force F1.

Once the tension is exerted in the linkage 15, it is necessary to maintain this tightening tension in order to be able to release the gripping device 1. This function is ensured by a locking means 22 that is integrated into the return elements 52a and 52b. These elements 52a and 52b simultaneously ensure a sliding function in one direction, and a locking function in another direction. The return elements 52a, 52b, can be constructed as described in FR 2 757 026.

To combine these two functions, the return elements 52a and 52b can be suitably oriented on the upper O, such that the force F1 on the linkage 15 makes it possible to slide the linkage in the return elements 52a and 52b, and also to exert a reverse-locking action. But the return elements 52a and 52b can also be oriented so as to promote the sliding along the direction of the force F1, then, once the force F1 has been applied, the user exerts a force F2 oriented substantially forward. This force F2 changes the orientation of the linkage 15 in the return elements 52a and 52b and makes it possible to use said return elements 52a and 52b in their locking function.

To facilitate the sequence of the actions of tightening and loosening the lower tightening zone 16e, the return elements 52a, 52b, 53a, and 53b, which are located in the lower tightening zone 16e, include guiding means adapted to prevent the linkage 15 from escaping during the loosening. One way to implement these guiding means consists of using return elements which include a channel from which the linkage 15 cannot escape unexpectedly.

Figure 2 shows the second and last tightening phase of the footwear CH, which is still a boot adapted to snowboarding. This tightening phase makes it possible to tighten the upper tightening zone 16f by bringing the portions 12a and 12b of the upper O closer together. The present lace-up device therefore makes it possible to separate the tightenings and their intensities for the lower tightening zone 16e and the upper tightening zone 16f. Indeed, the tightening of the upper tightening zone 16f does not have any effect on the tightening of the lower tightening zone 16e due to the locking function of the linkage 15 which is integrated into the return elements 52a and 52b.

To undertake the second tightening phase, the user first positions the linkage 15

manually in the return elements 51a and 50a and their counterparts, located on the opposite portion 12b. The users crisscrosses the linkage 15 in a known fashion by going upward from the return element 52a up to the return element 50a. To be able to perform this manual operation, the return elements 50a, 50b, 51a, and 51b, located in the upper tightening zone 16f are of the hook type. In other words, they are open so as to retain the linkage 15 in the direction that brings the two portions 12a and 12b of the upper O closer together.

Once the linkage 15 is positioned, the user pulls, along a substantially upward force F3, on the gripping device 1 which is positioned on the linkage 15 at the level of loop 2. This action tensions the linkage 15 which brings the two portions 12a and 12b of the upper O closer together, at the level of the upper tightening zone 16f. The tightening tension is maintained in this zone 16f due to a means for locking the linkage 15.

This locking can be obtained in two different ways. First, the return elements 50a and 50b, which are positioned at the end of the tightening zone 16, and at the junction of the upper tightening zone 16f and the loop 2, integrate a locking means 23. This locking means is substantially similar to the locking means 22 arranged on the return elements 52a and 52b and described previously. Similarly, the user can lock the linkage 15 by pulling along the direction of the force F3 if the return elements 50a and 50b are arranged on the upper O along a specific orientation. Conversely, the user pulls on the gripping device 1 with the force F3, then displaces said device 1 forwardly along a direction F4 to ensure the locking of the linkage 15 according to a previously described mechanism.

Second, the locking means 20 can be integrated into an independent locking element 21 that is slidably mounted on the loop 2. To perform the locking, the user pulls on the gripping device 1 along the direction F3, then displaces the locking element 21 along a direction Δ that brings the locking element 21 closer to the return elements 50a and 50b. Preferably, the blocking element 21 is slidably mounted concurrently on the two strands of the loop 2. Of course, the locking means 20 can be obtained by two locking elements sliding on each of the strands of the loop 2, respectively. In this case, the user must displace the two locking elements to lock the linkage 15.

Moreover, the two aforementioned locking devices can be combined for increased safety against ill-timed loosening, which may occur on this type of boot that are subject to substantial forces during the sporting activity. Figure 2 shows this combination with locking means 23 integrated into the return elements 50a and 50b and the locking element 21 mounted on the loop 2 of the linkage 15.

The tests conducted have shown the interest of using a flexible and substantially non-

stretching linkage 15. The flexibility is necessary in the travel imposed by the position of the return elements, and the non-stretching ability makes it possible to limit the elongation of the linkage 15, in particular at the level of the loop 2, during the tightening.

Indeed, the tension obtained by the rigid frame 3 of the gripping device 1 is so substantial that, in the case of a conventional lace, or even a string, the user would spend his energy in untying the lace instead of bringing the two portions 12a and 12b closer together. The best results were obtained with a linkage 15 obtained with a linkage made of kevlar or aramid, and whose outer diameter is between 2 and 4 mm.

Figure 3 shows a detail of the lace-up device at the level of the gripping device 1 and its rigid frame 3. This frame 3 comprises a contact surface 4 which is complementary of at least three fingers 25x, 25y, and 25z of the hand M. This contact surface 4 comprises three cavities 4x, 4y, and 4z which assume the morphology of the fingers 25x, 25y, and 25z, respectively, when folded around the frame 3. Tests have shown that to obtain a more powerful tightening, the fingers used preferably are the forefinger, second finger, and third finger.

In addition, in the preferred embodiment shown, the frame 3 also serves to close the loop 2 constituted by the linkage 15. The gripping device 1 includes hooking means 5c and 5d that are adapted to cooperate with the two ends 15c and 15d, respectively, of the linkage 15. The hooking means 5c, 5d can be constituted by a wall 100, perpendicular to the linkage 15, which is integral with the rigid frame 3. A hole 101 in which the end 15c of the linkage 15 passes is provided in this wall 100. This end 15c is equipped with a locking means, such as a knot 102 whose diameter is greater than the diameter of the hole 101.

Of course, as shown in Figure 4, the linkage 15 can also extend right through the frame 3. The ends 15c and 15d of the linkage 15 are connected to return elements 54a and 54b located substantially at the ends of the tightening zone 16. However, in this embodiment, the loop 2 which includes the frame 3 is not located at one of the ends of the tightening zone 16. The loop 2 is located outside the tightening zone 16, but extends substantially perpendicular to the plane defined by the tightening zone 16 so as to divide said zone 16 into two tightening sub-zones 105 and 106.

Furthermore, the gripping device can be provided with an improvement not shown. In this improvement, the gripping device includes a fastening means complementary of the footwear which makes it possible to store said gripping device on the footwear. This fastening means can advantageously be of the self-gripping type, or in the form of a snap-fastener. The footwear can also be provided with a pocket or a strap forming a loop in

which the gripping device could be housed when it is out of the tightening and loosening phases. In addition, the gripping device can advantageously include comfort elements constituted of a softer material than that of the frame, and positioned at the level of the contact surface adapted to be in contact with the fingers of the hand.

Of course, the present invention is not limited to the embodiments described hereinabove, which are provided for guidance only, but encompasses all similar or equivalent embodiments.